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## **ECOLOGICAL - ECONOMIC ASPECTS OF BIOFUELS IN THE ENERGY SAVING THE STATE POLICY**

*The article highlights the ecological - economic aspects of biofuel production. Displaying the author's view of the major international organizations, providing a significant impact on energy policy. Determined the feasibility and necessity of the biofuels market in the context of energy saving policy.*

**Keywords:** *environmental safety, energy efficiency, expediency and security, energy policy, environmental strategy, biofuels.*

**Introduction.** Global civilization development has a significant impact on the environment. Significant use of oil and gas during the twentieth century led to increased emissions of CO<sub>2</sub> into the atmosphere, creating the threat of global warming. The international community, aware of the essence of the new challenges and threats, expanded concept of security, taking into account not leave out the economic, political, social, cultural, and environmental aspects as well. The issue of environmental safety becomes geopolitical nature. Therefore, in the world, particularly in Ukraine and studied actively introduced the latest developments in the field of alternative energy sources. Leading among them is biofuel.

Problems of production, environmental and economic feasibility of biofuels and dedicated research by many scientists such as O.V. Dubrovin, U. Dubnevich, G.M. Kaletnik, I.G. Kirilenko, M.I. Kobec, T.O.Kovalenko, V.Y. Mesel-Veselyak, T.O. Ostashko, Y.V. Yurkevich et al.

**Goal.** The main purpose is to study the feasibility and safety of using alternative energy sources, including biofuels, in terms of energy saving policy.

**Methodology.** To investigate this issue were used scientific methods such as observation, synthesis, synthesis and abstraction.

**Exposition of basic material.** The main principles of ecologically sustainable society is outlined S. Podolynsky, who is the founder of the modern paradigm of ecological economics. He argued that organized human labor can harmonize the relationship between society and nature, avoiding energy crisis [1].

At present, the main issues of sustainable development were outlined during the Rio de - Janeiro Global Conference on Sustainable Development "The future that we want." Main topics of discussion was devoted to building the country "green" economy principles are : equality and equity of resource allocation , caution against the social implications and impact on the environment , understanding of high value natural and social capital, resource efficiency , sustainable consumption and production , creating "green" jobs.

The study of international experience energy indicates different approaches proceedings energy policy as countries and groups (Scheme 1). Energy-saving measures implemented in the area of housing, industry, transport, act as inter-branch programs. However, promotion, financing and management programs in most countries of the CIS and Central Europe are inadequate and voluntary agreements - are largely absent. In our opinion, a more effective these measures are carried out in the European Union. However, the differences between states do not allow the organization to conduct a comprehensive energy policy.

EU energy policy aimed at the development of competitive domestic market, which is based on the development of renewable energy sources. To ensure an end to the EU by sustainability requirements and targets developed in the form of shares of renewable energy (Table 1).

		Popularization	Sources of funding	Regulation	Voluntary agreements
Applications in the housing sector	CIS / CE	Activities were limited to making brochures and manuals for population and public information campaigns in the media.	There are rare cases of establishment of funding mechanisms	A review of old standards and norms in the construction and energy efficiency equipment.	Information is virtually absent.
	EU countries	Along with the spread of information through the media are numerous counseling centers training programs.	Providing grants for the elderly and needy and procedures refund due to energy saving measures	Implemented energy-efficient labeling programs Domestic equipment and minimum energy consumption	Relating conditioning energy-saving household and office equipment.
Energy-saving programs in the industry	CIS / CE	Publication of books on energy efficiency in industrial conglomerates taprohramy energy audit .	Almost is not funding energy efficiency measures in industry	The system of regulation of power consumption .	No voluntary agreement.
	EU countries	Dissemination of information on energy efficiency in the industrial conglomerates is very important	Used performance - Contracting, taxbenefits, loans.	A widespread practice of creating special energy management services .	The common practice of voluntary agreements in the industry
Energy saving program for transport	CIS / CE	In some CIS / CE are general programs promoting energy efficiency	There is little financial mechanisms dissemination techniques and practice energy conservation.	There are few mechanisms for regulation of energy transport	Actually no
	EU countries	Regular information companies in the media, saving on transport courses , courses economical driving.	There is little financial mechanisms distributing energy in the EU	Introduced methods of standardization fuel efficiency of vehicles	The common practice of conclusion of voluntary agreements with vehicle manufacturers to improve their energy efficiency.
Intra energy storing program	CIS / CE	There are programs to improve energy efficiency of municipal economy.	There is little financial mechanisms	Implemented mainly using standards and construction standards.	Actually no
	EU countries	Developed counseling centers, distributed information energy conservation in regional media networks .	There are financial mechanisms for dissemination of energy management to consumers - DSM	Application of standardization efficiency of fuel and energy resources.	Actually no

**Shema1 Description of measures on energy saving CIS countries, Central Europe and the European Union**

Source: Grouped by the author on the basis of source [2]

Table 1

**Sustainability requirements defined by the Directive on Renewable Energy**

Sustainability criteria	Description	Notes
1. Reduction of greenhouse gases	<ul style="list-style-type: none"> <li>• at least 35 % for plants commissioned after January 23, 2008 , at least 50% from 2017</li> <li>• at least 60 % for plants commissioned after 2017.</li> </ul>	Detailed methodology for calculating GHG listed in Annex V Directives. If biofuels produced before 23.01.2008, the requirement is 35% effective from 1.04.2013 year.
2. Land use restrictions	Raw materials for the production of biofuels can grow on land with the following status: <ul style="list-style-type: none"> <li>•land with high biodiversity (forest and forested areas, conservation areas, meadows biovarious)</li> <li>•land with high carbon content ( water -no-marshes , forests cover a defined level )</li> <li>• peatbogs.</li> </ul>	In many cases, providing further evidence of conservation land defined characteristics, allows farmers to meet these requirements.
3. Practice proper management	Requirements under the counter, developed under the Common Agricultural Policy, apply to grow crops for biofuels.	Requirements for reciprocal conformity apply only primary producers in the EU.
4. Social sustainability of biofuels	Policy on biofuels should not adversely affect the availability of food, to protect rights to land and touch the wider development issues in the EU and third countries	The development covers provisions for the employment of the obligations the adoption and implementation of ILO Conventions set out in the Directive.

Source: Directive 2009/28/EC on the promotion of renewable energy and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

The main documents of the "new energy policy" that define common rules for the internal market in electricity and gas , steel Energy Charter Treaty and the Energy Charter Treaty . Directives 2003/55/EC and 2003/54/EC outlined the principles of the market that would ensure free competition, development companies and consumer interests. It should be noted that the level energy availability own energy resources in the EU varies considerably, creating significant barriers to the formation of uniform prices, and hence the free competition. For example in Estonia, people pay for 1 thousand cubic meters of gas consumed 195 euros, and in Germany - 545 euro [ 3].

In the so -called "Green Paper" The European Union describes the main approaches to the nature of the new energy policy:

- the need for stable energy supplies to the EU from countries exporting energy resources;
- the importance of market liberalization;
- the need for energy savings;
- development of new technologies in the energy sector;
- increasing environmental requirements for power consumption.

Key role in the environmental strategy of the EU allocated program of transition to alternative and renewable energy sources, including much emphasis on biofuels. Directive on Renewable Energy 2009, the European Commission ordered to increase the share of renewable energy to European countries in 2020 to 10%. Moreover, the energy has special requirements: the proportion of carbon emissions during its use must be at least 35% less than gasoline (assumed to increase beyond 60% in 2018) [4]. But the priority of biofuels may cause an imbalance in the natural environment and threaten food security. It is possible to see new strategies and supplement guidelines.

Under the new scheme emissions trading provides a gradual loss of the right to free quota of power producers and the application of the mechanism auctions in buying them. However, in our view, could cause involuntary contraction of industrial production [5].

Consider a more decisive influence on the development of the biofuels market economies and the environment. The evolution of technology biofuels includes 3 stages:

1. The origin of the thought of the use of biofuels, along with traditional fuel sources that period;
2. Implementation of scientific research regarding the feasibility of using biofuels and the development of technologies of its production;
3. The practical implementation of scientific development and commercialization of global biofuels market [6].

Given the shortage of natural reserves of oil one of the most affordable alternatives to traditional fuels are liquid biofuels, concentrated source of energy. The most effective among its varieties are biodiesel (90 % of energy fuel oil ), ethanol (60 %) and methanol (35%). Of these, the most economical to produce and fully compatible with engines of commercial vehicles and fuel systems are energy [7].

With technological principles biofuel divided into three groups: first, second and third generation.

First generation biofuels requires a large amount of arable land or transfer of shares of food crops in raw materials, leading to serious food shortages. Thus, for energy culture production in 2008 was used 2 % of total world stock of arable land, equal to 36 million hectares [8]. The problem of global food crisis is one of the priorities at the UN. It identifies the main causes of price rise of food prices, among which is a significant increase in oil prices, depletion of natural fuel reserves and growing crops .UN launched a series of anti-crisis measures for food security in the amount of 15 billion dollars. Ukraine, with its rich black soil, has a real opportunity to take a leading position world manufacturer of food [5]. Biofuel first type distorts the global market for agricultural products.

Second-generation biofuels produced from biomass (non-food parts of plants, non-food plants and industrial waste).

Even today, in most EU countries, a ban on dumping calories than 6 MJ / kg, as they can be the raw material for alternative fuels and recovered by heat [9]. Therefore there is a need to look for alternative methods of recycling waste. Currently, second-generation biofuels, used only in rare experimental production due to significant energy consumption and more expensive technology.

In third generation biofuels placed greatest hope scientists. Biofuel production from algae provide cleaner gasoline without the use of agricultural land and without fresh water, fertilizers and plant protection products with stable performance up to 100 t ha per year [6]. Fuel for life with special bacteria (genetically modified organisms could consume plant residues producing saturated hydrocarbons (alkanes), which is the basis of gasoline) in mass production can be a decent substitute for

gasoline, the cost not to exceed \$ 50 per barrel. The development of third-generation fuels are still at the research stage and are not widely used. "Modern energy solves the problem of choosing between fuel and food," but the lack of this type is the high production cost [8].

Leading specialists from research revealed that biofuels, depending on many factors that can make both negative and positive impact on the environment. In March 2011, Switzerland, during the roundtable on sustainable biofuels were asked to show options for biofuels certification system that clearly delineate species on environmentally dangerous and necessary. Different approaches to the issue of measuring the impact of biofuels on the environment provoked a number of contentious issues. The influence of production can vary considerably depending on the type of biomass, volume, spatial location, etc.

Growing of sugar cane in the central regions of Brazil for ethanol production has caused local cooling at 0.93<sup>0</sup>. This regional cooling reduces the impact of increased agricultural productivity and land use in arid regions [4]. Moreover, the use of meal in the production of ethanol from sugar cane, provides electricity to the manufacturing process.

Production of biofuel from palm oil can reduce emissions by 80%, however, if the production will cause tropical deforestation, the greenhouse effect will increase by 800% or more, and if the production of peat forest will be destroyed - then by 2000% compared to fossil fuels.

The use of ethanol from corn can reduce up to 60% of carbon dioxide emissions. But if the production and processing of this type of fuel used fossil fuels, the greenhouse gas emissions will increase to 5%.

Global trends point to the rapid development of biofuels, the most common is the production of bioethanol and biodiesel. During 2000-2007, ethanol production has increased almost threefold and biodiesel - to 11-fold. Only in 2007, the value of global investment in biofuels production exceeded \$ 4 billion. This global biofuel revolution is not developed and is only 3 billion liters. Even a small share of biofuels in total fuel consumption (1.8 %), according to experts is significant. According to

research consultancy Corporation Merrill Lynch, ending production of biofuels will increase oil prices by 15 % [ 8].

In Ukraine, the process of greening the economy has two dimensions - "the formation of new "green industries "economy" and" ecological modernization". Particular attention is paid to the problems of energy sector, including energy security. High energy economy and reduce wasteful energy consumption competitiveness, creating pressure on the trade balance and strengthens the economic, political and energy dependence of our country. Therefore, July 1, 1994 was approved by the Law of Ukraine "On Energy Saving" that defines the legal, economic, social and environmental basis for all energy companies, associations and organizations as well as citizens.

Ukraine's energy intensity is several times higher than in developed countries. The share of energy cost of the product ranges from 30 to 60%. Energy intensity of GDP is relatively small critical volume of GDP (Table 2), the rate of which in terms of per capita less than about 30 times higher than in developed countries.

*Table 2*

***The energy intensity of world GDP, and GDP Ukraine (kg o. e./\$)***

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
World	0,291	0,296	0,290	0,267	0,248	0,237	0,224	0,204	0,188	0,196	0,190
Ukraine	0,836	0,746	0,686	0,626	0,552	0,518	0,472	0,418	0,391	0,387	0,390

Source: [10], [11], [12].

Ukraine's energy level is average. Only 53% is provided by the need for fuel - energy resources. Energy scarceness economy is primarily due to the import of natural gas (75%) and oil (85 %).

The largest consumer of energy in the economy of Ukraine is the steel industry (50 million tons of fuel per year) and agricultural production (35 million tons of fuel per year). Increasing energy prices and a high proportion of energy cost of the product, affect the competitiveness of their products on a global level. This

necessitates the use of alternative energy sources. Among which occupies an important place biofuels.

In Ukraine, in order to stimulate biofuel production coefficients used "green" tariffs for electricity from biomass and biogas equal to 2.30 and gradually decrease to 1.61 in 2025.

Due to energy conservation, according to experts, Ukraine in 2020 may reduce the cost of energy imports about 38 billion dollars (equivalent to 470 million tons of standard fuel). According to the State Agency on Energy Efficiency and Energy Saving of Ukraine, as of September 1, 2013 power renewable energy facilities are 956.2 MW, of which 310.5 MW - commissioned in the current year. It is possible to save more than 5.7 billion m<sup>3</sup> of natural gas.

Basis of the environmental strategy of the world is to support technology-innovation, financed development projects and research in the field of ecology and health. Strengthening the requirements of environmental standards and rising fuel prices encourage the industry of developed countries to shift to Innovation and economic mode of production. Therefore, new environmental strategies lead to drastic changes, reforms and restructuring of the national production.

**Conclusions.** Agro area undoubtedly the most difficult acts deliberately changeable people during their life part of the biosphere. The difficulty lies in its active interaction with the inanimate and intelligent. Nature is able to reproduce itself in the long term and sustainable development agro area directly dependent on the actions of man. To date, the government should use this ecological-economic mechanism of nature in which economic relations have evolved in the use of natural resources and promote sustainable carried their use and recovery. The action of this mechanism is enhanced by the creation of an effective system of environmental management, which is based on both the strategic interests of the state and the needs of future generations. It is advisable to harmonize national environmental legislation with international, following European standards due to the orientation of the country towards European integration.

Renewable energy sources such as wind, water and sun provide humanity electricity, but the bulk of the engine needs fuel oil. With the rapid growth of transport in the world, reducing oil and gas, and with the threat of environmental catastrophe demand for biofuel is not a choice but an objective necessity. Taking into account the latest research and production of biofuels along the first and second generation determined the feasibility and development of next-generation biofuels.

### **Bibliography**

1. Ходаківська О.В. Екологічна парадигма – основа розвитку господарських систем // Фізична економія у вимірах теорії і практики господарювання: колективна монографія / За ред. Ю.О. Лупенка, В.М. Жука, В.О. Шевчука та О.В. Ходаківської.- К.: ННЦ «Інститут аграрної економіки», 2013. – С 226-227
2. Енергозбереження як фактор підвищення конкурентоспроможності господарювання та національної економіки Екологізація виробництва [Електронний ресурс]. – Режим доступу:[www.academia.org.ua/?p=330](http://www.academia.org.ua/?p=330)
3. "Використання енергозберігаючих технологій в країнах ЄС: досвід для України". Аналітична записка[Електронний ресурс]. – Режим доступу:<http://www.niss.gov.ua/articles/262/>
4. Стратегія екологічної безпеки України у контексті міжнародного досвіду. Відділ інтеграції та стратегічного партнерства/ Ж.Журавльова [Електронний ресурс]. – Режим доступу: <http://old.niss.gov.ua/Monitor/July08/21.htm>
5. Інноваційні напрямки розвитку біопаливних технологій [Електронний ресурс]. – Режим доступу:[www.rusnauka.com/10.../4\\_106647.doc.htm](http://www.rusnauka.com/10.../4_106647.doc.htm)
6. Біопаливо наступного покоління/Пітер Ферлі [Електронний ресурс]. – Режим доступу:[www.nauka.in.ua/.../biofuel%20\(1\)%201.pdf](http://www.nauka.in.ua/.../biofuel%20(1)%201.pdf)
7. Калетнік Г.М. Розвиток ринку біопалива в Україні: Монографія.- К.: Аграрна наука,. 2008. -С. 34

8. Біопаливо: ще одне суперечливе питання. Екологія життя [Електронний ресурс]. – Режим доступу: [www.eco-live.com.ua/.../biopalivo-sche-odne-s..](http://www.eco-live.com.ua/.../biopalivo-sche-odne-s..)
9. Екологічні аспекти використання альтернативних палив в цементному виробництві Софія Хруник, Мирослав Саницький, Кшиштоф Рецько [Електронний ресурс]. – Режим доступу: [www.rusnauka.com/29\\_NNM.../35988.doc.htm](http://www.rusnauka.com/29_NNM.../35988.doc.htm)
10. [Електронний ресурс]. – Режим доступу: [http://www.google.com.ua/publicdata/explore?ds=d5bncppjof8f9\\_&met\\_y=ny\\_gdp\\_mktp\\_cd&tdim=true&dl=en&hl=en&q=world+gdp](http://www.google.com.ua/publicdata/explore?ds=d5bncppjof8f9_&met_y=ny_gdp_mktp_cd&tdim=true&dl=en&hl=en&q=world+gdp)
11. [Електронний ресурс]. – Режим доступу: [http://www.bp.com/assets/bp\\_internet/globalbp/globalbp\\_uk\\_english/reports\\_and\\_publications/statistical\\_energy\\_review\\_2011/STAGING/local\\_assets/spreadsheets/statistical\\_review\\_of\\_world\\_energy\\_full\\_report\\_2011.xls](http://www.bp.com/assets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2011/STAGING/local_assets/spreadsheets/statistical_review_of_world_energy_full_report_2011.xls)
12. [Електронний ресурс]. – Режим доступу: <http://www.tradingeconomics.com/ukraine/gdp-ppp-us-dollar-wb-data.html>

### **Анотація**

**Гуцаленко О.О., Корпанюк Т.М.**

**Еколого - економічні аспекти виробництва біопалива в контексті енергозберігаючої політики держави**

*В статті висвітлено еколого – економічні аспекти виробництва біопалива. Відображено авторський погляд на провідні міжнародні організації, що здійснюють вагомий вплив на енергетичну політику країн. Визначено доцільність та необхідність розвитку ринку біопалива в контексті енергозберігаючої політики держави.*

**Ключові слова:** екологічна безпека, енергоефективність, доцільність та безпека, енергетична політика, екологічна стратегія, біопаливо.

## *Аннотация*

*Гуцаленко О.О., Корпанюк Т.Н.*

*Эколого-экономические аспекты производства биотоплива в контексте энергосберегающей политики государства*

*В статье освещены эколого-экономические аспекты производства биотоплива. Отражены авторские взгляды на ведущие международные организации, осуществляющие существенное влияние на энергетическую политику стран. Определена целесообразность и необходимость развития рынка биотоплива в контексте энергосберегающей политики государства.*

*Ключевые слова:* экологическая безопасность, энергоэффективность, целесообразность и безопасность, энергетическая политика, экологическая стратегия, биотопливо.